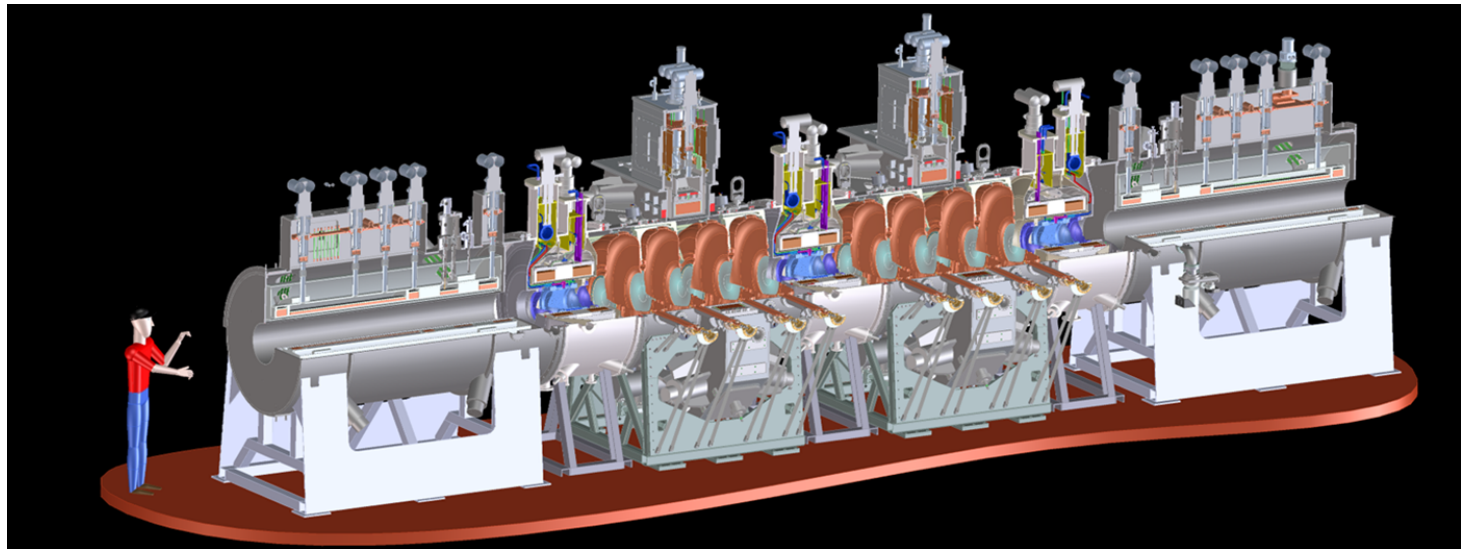


Status of the Muon Ionization Cooling Experiment (MICE)



Pavel Snopok (IIT/Fermilab)
All Experimenters' Meeting
May 5, 2014

Outline

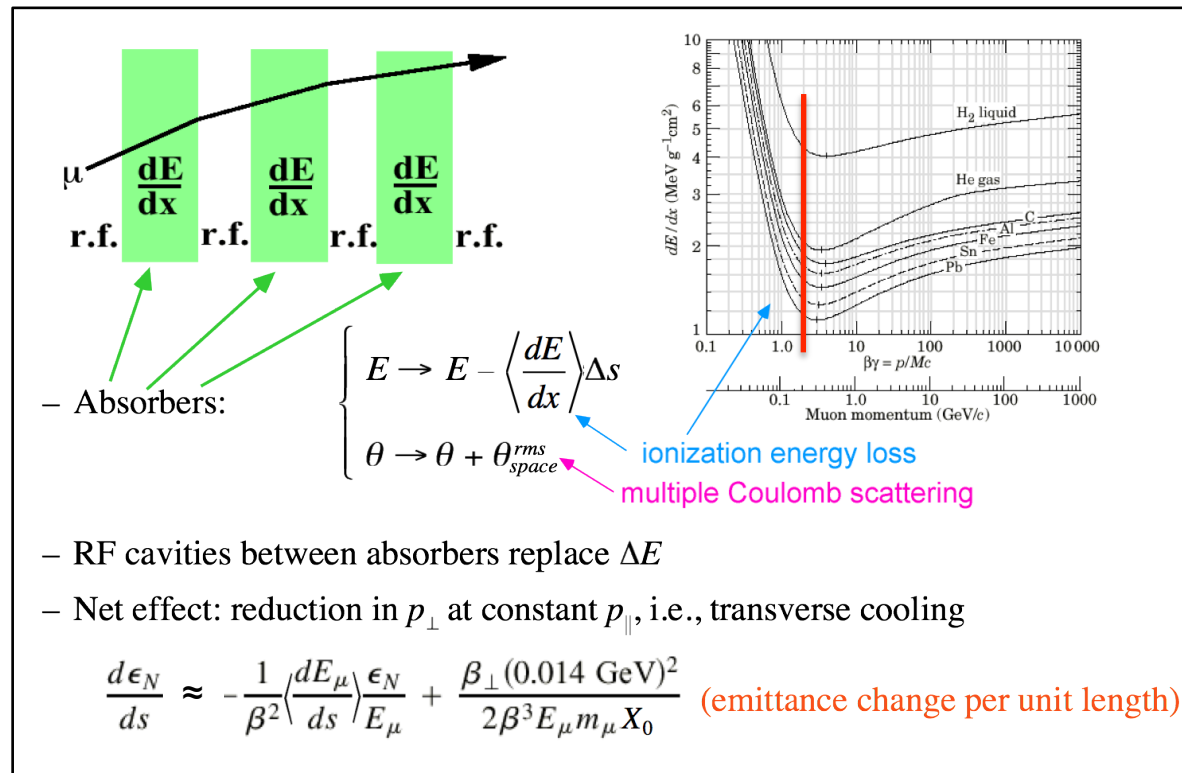


- Intro and Goals
- Scope & Timeline
- Recent Progress
- Conclusion

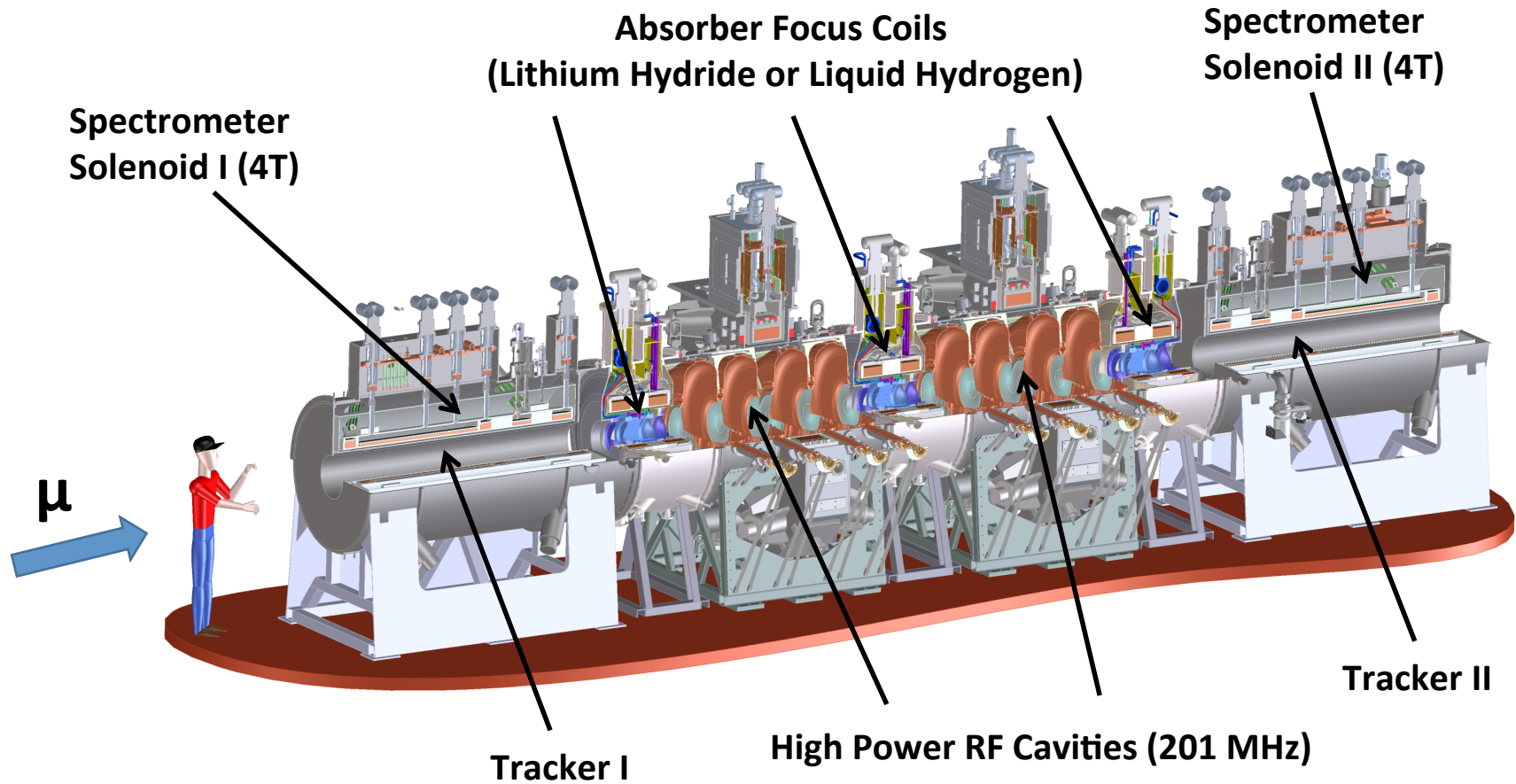
Ionization Cooling

- Ionization cooling is crucial technique for muon colliders and neutrino factories

- Only practical way to cool a muon beam before it decays
- Only way to achieve desired neutrino flux or collider luminosity

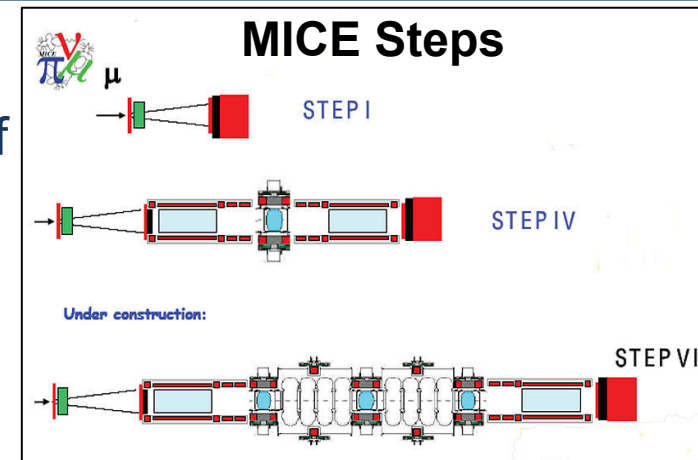


Full (“Step VI”) MICE Configuration



MICE Deliverables

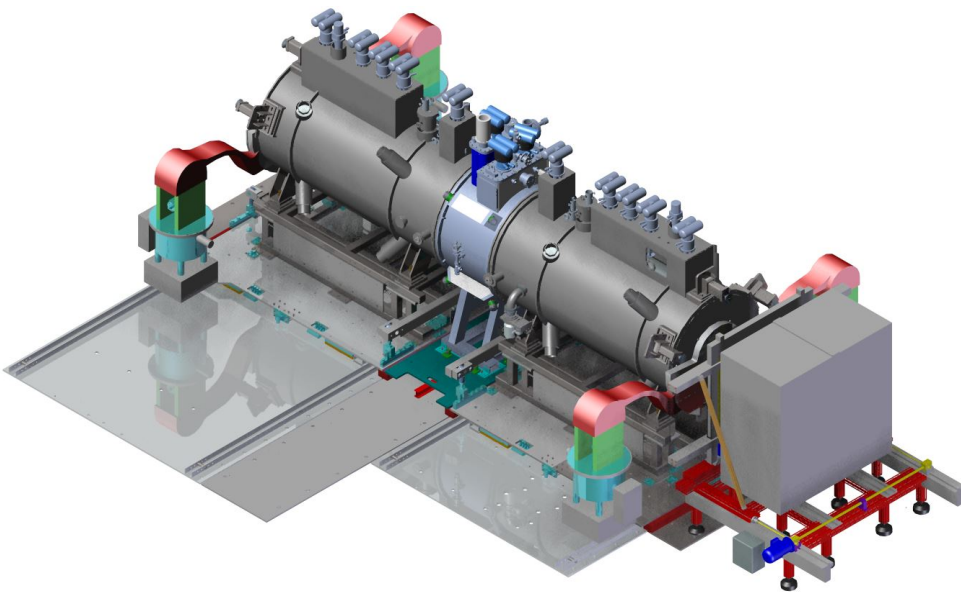
- MICE Goals
 - Demonstrate feasibility and performance of cooling by building and testing actual sections of cooling channels
 - Validate Monte Carlo models
 - Understand performance well enough to reliably extrapolate cost of muon cooling channels for MC or NF
 - Measurement of $\approx 10\%$ emittance reduction to 1% relative precision, i.e., 10^{-3} emittance resolution
 - Requires particle-by-particle measurements
- MICE Step IV:
 - Demonstration of ionization cooling of muons, but without re-acceleration (i.e., “non-sustainable” cooling)
 - Precision measurements of absorber effects on beam
 - validate our simulation models
- MICE Step VI:
 - Demonstrate sustainable cooling, with RF re-acceleration
 - Full exploration of lattice optics and detailed validation of simulations



Step IV equipment status

MICE near-term goal: Step IV

One absorber module, no RF:
1st cooling test (without reacceleration)



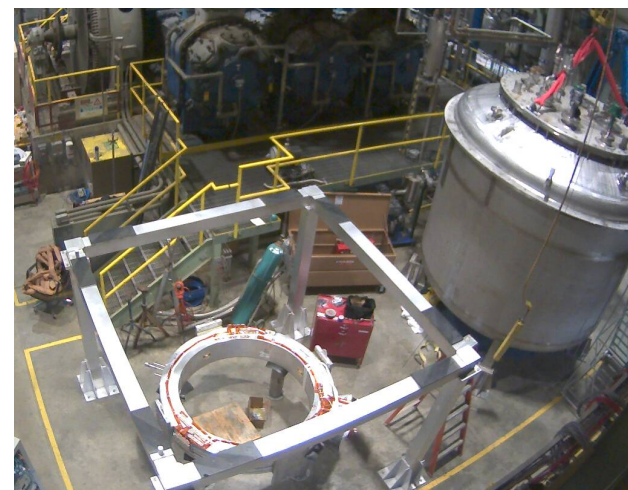
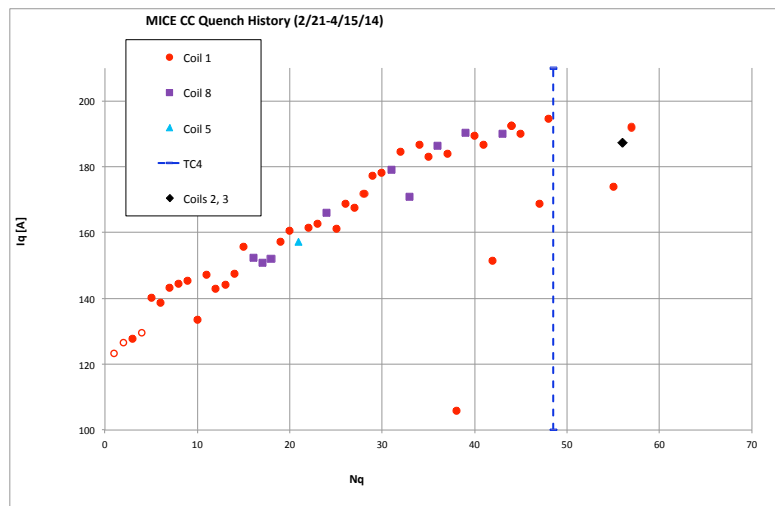
- Spectrometer Solenoid #1 shipped to RAL
- Focus Coil #1 under test
- Focus Coil #2 arrive back at RAL mid-May
- Lithium hydride – shipping being arranged
- PRY – UK orders out / US out soon

Sub-system	Responsibility
Spectrometer solenoid #2	US
Spectrometer solenoid #1	US
Fibre tracker #1 + #2	Japan, UK, US
Focus coil #1	UK
LH ₂ system A	UK
Lithium hydride	US
LH2 absorber	Japan
Diffuser	UK
Virostek plate & TOF cage assy	UK, US
Substation upgrade	UK
EMR	Geneva
(Radiation shutter	UK)
AFC Moving platform #1	UK
SS platforms Installation	UK
Partial Return Yoke	UK, US

Recent Progress

- Both Spectrometer Solenoids successfully commissioned
 – now at RAL
- 1st Coupling Coil cold mass under test at FNAL Solenoid Test Facility

– design current reached

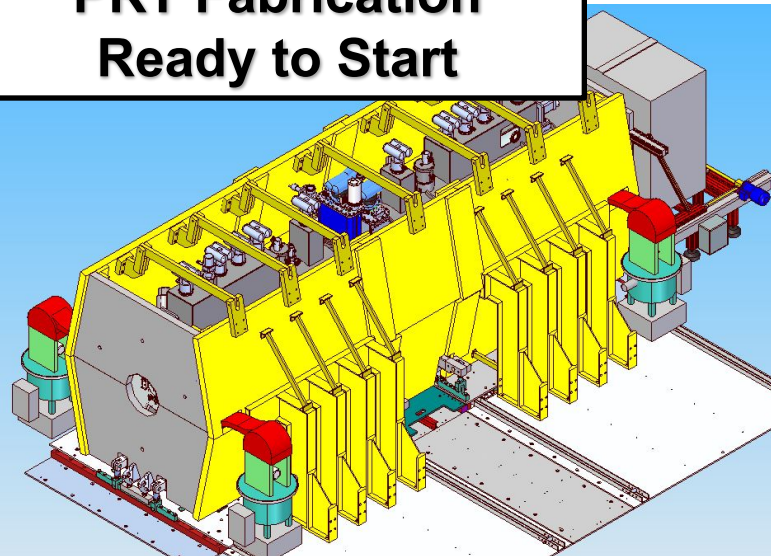


Assembling MICE Step IV

SS1, 5/1/14



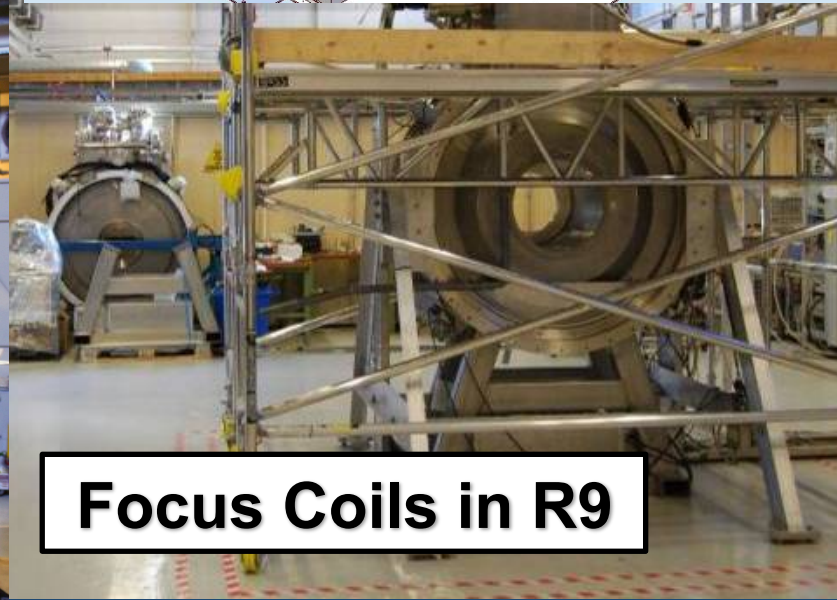
**PRY Fabrication
Ready to Start**



SS2 w/Tracker

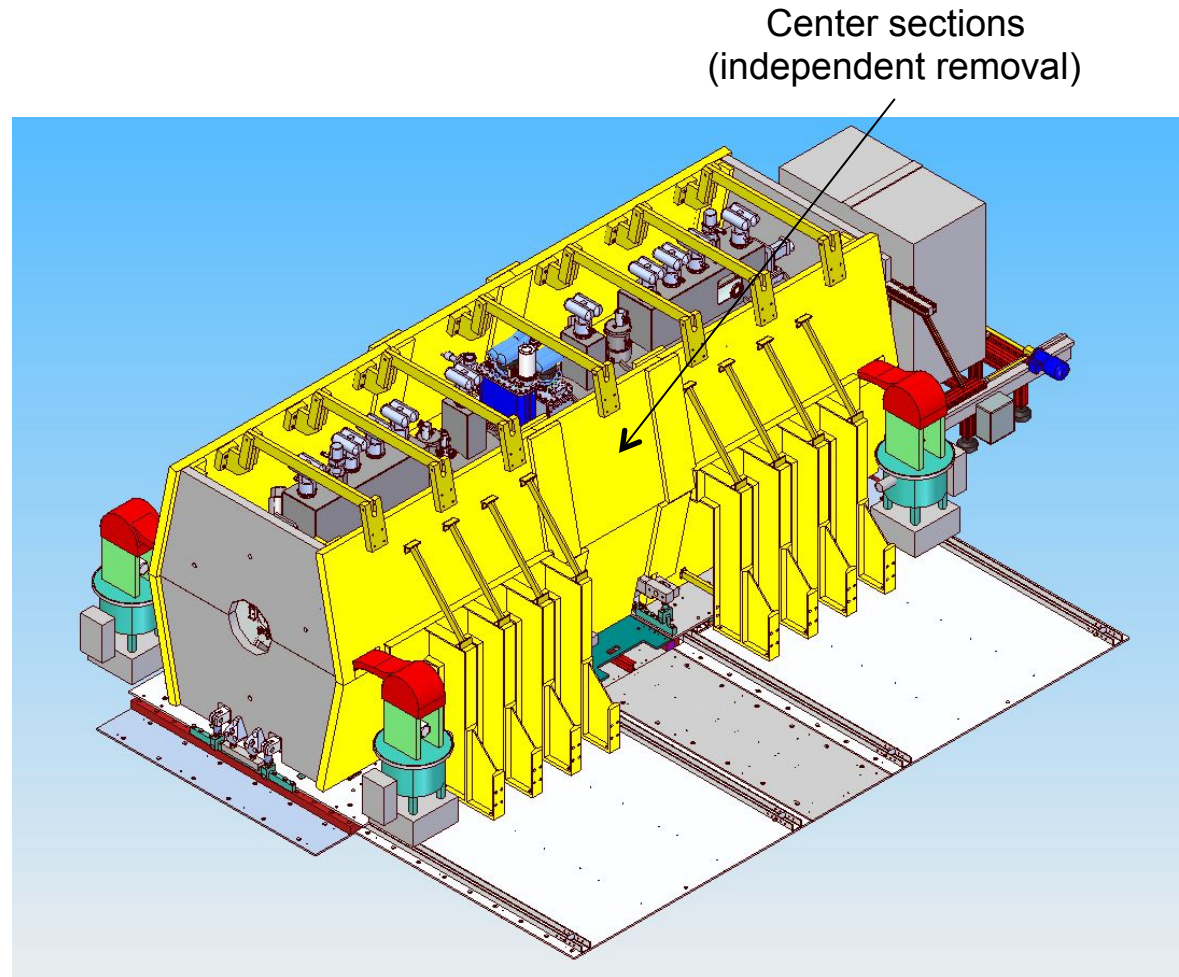


Focus Coils in R9

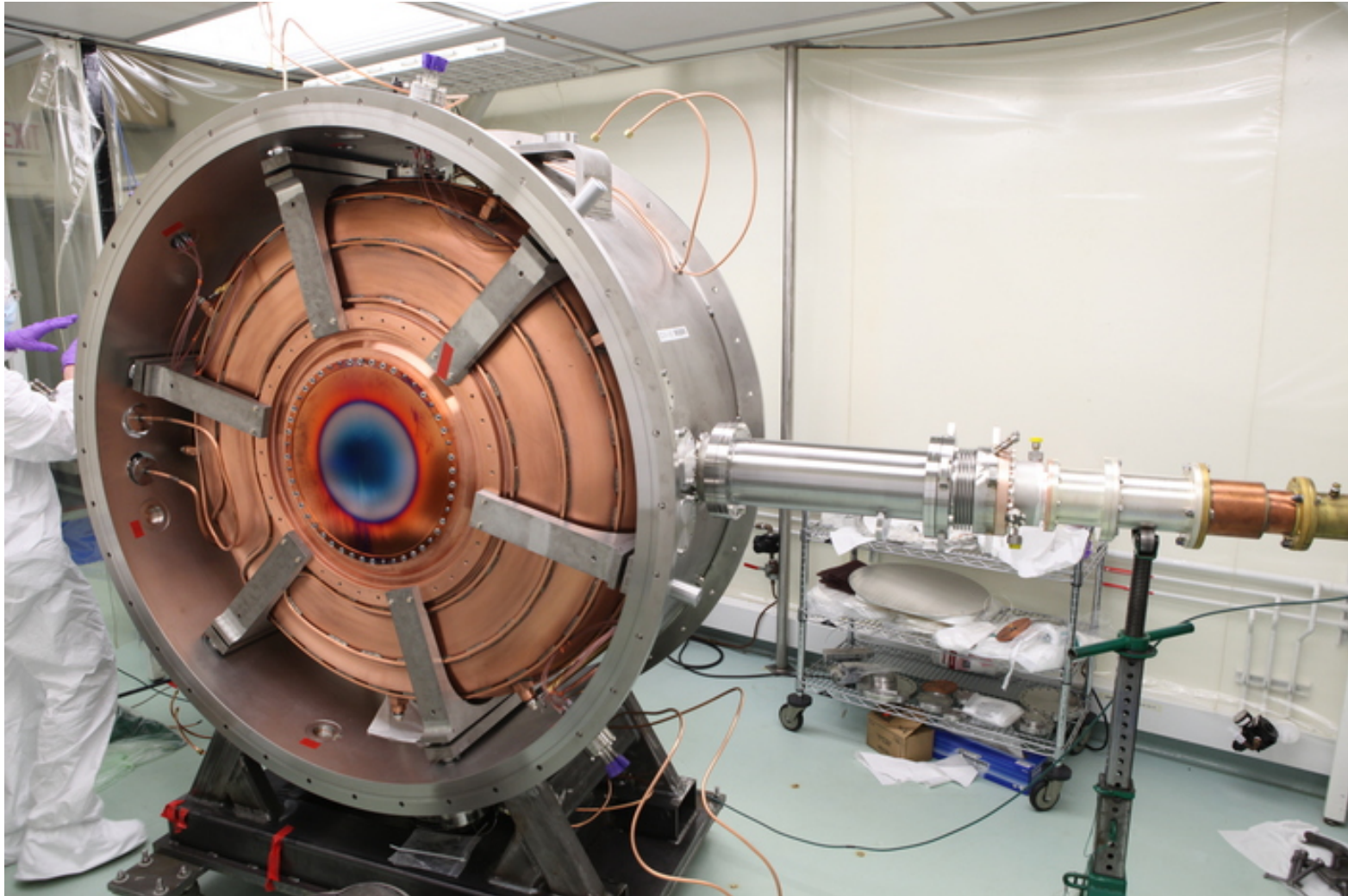


Step IV Partial Return Yoke

- Design complete
- Steel order placed
- Fabrication order in BNL procurement



Single Cavity Test System (SCTS)



MICE Resource-Loaded Schedule and Project Board Reviews



- The review went very well with extremely supportive comments and recommendations from the review committee
- The committee was very pleased with progress (as well as planning and scheduling)
- We were encouraged to:
 - Stick to schedule for the remainder of the Step IV deployment
 - And start focusing on getting a Step V configuration on the floor in timely fashion

Conclusion

- MICE is a program to demonstrate that ionization cooling is feasible and well understood
- Will demonstrate the principles of six-dimensional cooling as well as transverse
...and thus lay the groundwork for muon colliders and neutrino factories
...by 2019 if all goes well
- Progressing towards 1st (Step IV) data in 2015